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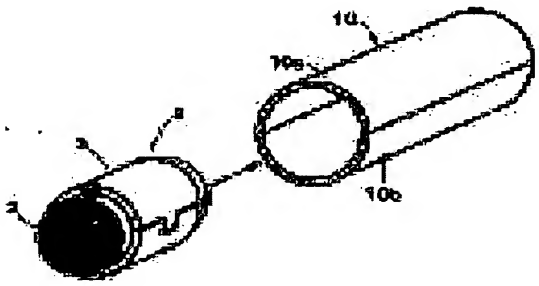
(54) METHOD FOR MANUFACTURING PURIFYING DEVICE CONTAINING HONEYCOMB STRUCTURE

(57)Abstract:
PROBLEM TO BE SOLVED: To suitably hold a honeycomb structure in a container, and to generate and maintain uniform and sufficient compression force in the overall periphery of a buffer member, in a method for manufacturing a purifying device for holding the structure via the buffer member in a container formed by connecting a plurality of dividing elements made of a metal.



SOLUTION: The buffer member (3) is mounted on the periphery of the honeycomb structure (2) and contained in the container (10) formed by connecting the plurality of dividing elements (10a, 10b) made of the metal. The container is radially reduced in the range of at least the buffer member to hold the member in a compressed state, and the structure is held in the container by a surface pressure to be imparted to the structure by the compression restoring force of the member. At least one end of the plurality of the elements are formed previously in a predetermined shape, and when the elements are connected, a necking part may be constituted by, for example, spinning the container.

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CLAIMS

[Claim(s)]

[Claim 1] In the manufacture approach of a honeycomb structure inside-of-the-body warehouse purge of holding a honeycomb structure object through a buffer member in the container which joins two or more metal part segmenter, and changes Equip the circumference of said honeycomb structure object with said buffer member, and it holds in said container. Cover the range in which said buffer member exists at least, reduce the diameter of said container, and said buffer member is held in the compression condition. the planar pressure given to said honeycomb structure object by the compression stability of said buffer member -- with, the manufacture approach of the honeycomb structure inside-of-the-body warehouse purge characterized by holding said honeycomb structure object in said container.

[Claim 2] The manufacture approach of the honeycomb structure inside-of-the-body warehouse purge according to claim 1 characterized by constituting the necking section to said container when [of two or more of said division objects / each] the end section is beforehand fabricated in a predetermined configuration at least and said two or more division objects are joined.

[Claim 3] The manufacture approach of the honeycomb structure inside-of-the-body warehouse purge according to claim 2 characterized by performing diameter reduction processing and forming in a predetermined end shape to the necking section of said container.

[Claim 4] Diameter reduction processing to the necking section of said container is the manufacture approach of the honeycomb structure inside-of-the-body warehouse purge according to claim 3 characterized by for the medial axis of said container and the medial axis of said necking section performing spinning in the condition of having the same axle, eccentricity, an inclination, and any one relation of the twist at least, and forming in a predetermined end shape.

[Claim 5] The manufacture approach of the honeycomb structure inside-of-the-body

warehouse purge according to claim 1 or 2 characterized by supervising the planar pressure given to said honeycomb structure object, and reducing the diameter of said container according to a monitor result.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach suitable as the manufacture approach of a catalytic converter of holding the catalyst support of a honeycomb structure object through a buffer mat in this container, concerning the manufacture approach of a purge of holding a honeycomb structure object through a buffer member in the container which joins two or more metal part segmenter, and changes.

[0002]

[Description of the Prior Art] The purge with which the honeycomb structure object which has a filtering function to a fluid was built in through the buffer member in the metal container is known, and purification of various fluids is presented. For example, in the exhaust air system of an automobile, the catalytic converter and the diesel particulate filter (henceforth DP filter) are carried, and the brittle honeycomb structure object made from a ceramic is used as catalyst support (or filter). As the manufacture approach of such a purge, the approach (a common name, midst doubling) of holding the buffer mat made from a ceramic in the metal vessel which consists winding and these of two or more metal part segmenter (the so-called half-object), and holding has spread through the periphery of the above-mentioned honeycomb structure object as a buffer member which has a seal function.

[0003] Although maintenance material will be strongly compressed since the both-sides part near the flange of each case is pushed strongly if only the flange of the both-sides edge of a catalytic converter is pressed down and a catalytic converter is assembled in JP,56-64116,A, concerning the manufacture approach of a honeycomb catalyst converter The central part which is separated from a flange makes it a problem not to fully compress maintenance material, but to distort the cross-section configuration of a case as a result, and for the compression condition of maintenance material to become different. The center section of vertical both the cases is pressed at the same time it pinches the flange of vertical both cases between a punch and female mold, and the approach of welding these both flanges is proposed.

[0004] Moreover, after compressing a tabular elastic attachment component in the

thickness direction beforehand, the approach with a group of the catalytic converter which approaches the periphery mutually in the casing half object of 2 rate casing so that catalyst support may be inserted, and was made to carry out joining-the-palms-together association of them is proposed by JP,59-138715,A. thereby, an elastic attachment component is ****** between 2 rate casing -- suppose that there is no fear of occurring un-arranging [that the attachment end face of ** and an elastic attachment component estranges mutually].

[0005] Furthermore, it sets to JP,9-112260,A. The maintenance mat wound around the peripheral face of the catalyst support which supported nothing and a catalyst, and its catalyst support in the cylindrical shape, It consists of casing equipped with the cylindrical shape support attaching part which holds said catalyst support where the maintenance mat is compressed. Said cylindrical shape support attaching part In the catalytic converter which is the assembly to which the edges-on-both-sides section prolonged in the direction of an axis of both **** of the two directions rate of a path was inserted mutually, and the both ** doubling part was joined, the catalytic converter which forms the cross-section oval body type with which said cylindrical shape support attaching part makes a major axis between said both ** doubling parts is proposed. And if the cross-section configuration of a cylindrical shape support attaching part is specified as mentioned above Since it is more possible than the case where each **** has circular inner skin to make inner skin of each **** gently-sloping while extending spacing between the edges-on-both-sides sections in each ****, in the process which fastens catalyst support by both **** While reducing the amount of penetrating to the maintenance mat peripheral face of the edges-on-both-sides section of each ****, the frictional force of each ****** peripheral surface over a maintenance mat peripheral face is lowered, and it is indicated that the tension over a maintenance mat can be eased.

[0006] Moreover, it sets to JP,10-47046,A. At least one or more outer cases are divided in the parting line in alignment with shaft orientations about the catalytic converter made from a ceramic. The division edge of a pair is formed in accordance with the parting line. At least to one side of the division edge of a pair The division edge of another side is contacted, the deformable deformation device for being welded is established, and it is indicated that the variation in the magnitude of the catalyst support made from a ceramic and an outer case is absorbable with deformation of this deformation device. And maintenance material is made with winding and a covering object to the catalyst support made from "ceramic about the approach of assembling. Then, the above-mentioned outer case is pressed from the exterior until it attaches an outer case to the above-mentioned covering object and the above-mentioned maintenance material generates fixed maintenance planar pressure. The welding

[then, / the division edge in which the deformation device was prepared is forced to the division edge of another side, and / both]" purport publication is carried out.

[0007]

[Problem(s) to be Solved by the Invention] When the holding power needed here in order to hold a honeycomb structure object in the predetermined location in a metal container is explained, the holding power of the direction of a path of a metal container is compression stability of the buffer member which works in the direction which intersects perpendicularly to the external surface of a honeycomb structure object, and the inside of a metal container. On the other hand, since the force of shaft orientations arises according to vibration or the exhaust-air-pressure force in a honeycomb structure object and a buffer member to the metal container fixed to the exhauster of an automobile, the holding power of the shaft orientations (longitudinal direction) of a honeycomb structure object is required as force which resists this, and this serves as a place which the frictional force between a buffer member and a honeycomb structure object and the frictional force between a buffer member and a metal container **.

[0008] In this case, it is desirable for it to be strong if possible and to give planar pressure, i.e., compressive force, to homogeneity in a hoop direction, after taking into consideration generating of the planar pressure which can inhibit migration of the honeycomb structure object by the acceleration when carrying in a car in consideration of the variation in the planar pressure resulting from the outer-diameter error of a honeycomb structure object. However, if compressive force is set up excessively, and/or if it sets up in a hoop direction at an ununiformity (in variation size), since a possibility that a honeycomb structure object may be damaged will serve as size, compressive force cannot be made into size from a predetermined value. Moreover, it is not easy to have to set up the amount of compression of a buffer member greatly, in order to make compressive force into size, and to hold a thick buffer member between a honeycomb structure object and a container. Especially the thing for which the perimeter is covered and uniform compressive force is acquired since only the compressive force of the direction where a division object approaches mutually cannot be made to act in the approach of holding in the metal vessel which consists of two or more metal part segmenter (half-object) is impossible on structure.

[0009] In JP,59-138715,A shown above, after compressing an elastic attachment component in the thickness direction beforehand, the approach with a group of carrying out joining-the-palms-together association of the casing half object is proposed so that catalyst support may be inserted, but although it becomes easy with a group by this, the above-mentioned technical problem cannot be solved. Although it plans to cover the perimeter and to acquire uniform compressive force in

JP,9-112260,A and JP,10-47046,A shown above on the other hand, neither can secure enough the compressive force of a direction parallel to a crack surface on structure. Especially the thing for which a part with the weak rigidity of a deformation device is prepared in JP,10-47046,A like a publication covers the perimeter, is not contrary to the request of securing sufficient compressive force, and cannot solve the above-mentioned technical problem.

[0010] Then, in the manufacture approach of a honeycomb structure inside-of-the-body warehouse purge of holding a honeycomb structure object through a buffer member in the container which joins two or more metal part segmenter, and changes, this invention makes it a technical problem to offer the manufacture approach that a buffer member covers the perimeter, and can generate and maintain homogeneity and sufficient compressive force while holding a honeycomb structure object in a container appropriately.

[0011]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the manufacture approach of the honeycomb structure inside-of-the-body warehouse purge of this invention In the manufacture approach of a honeycomb structure inside-of-the-body warehouse purge of holding a honeycomb structure object through a buffer member like in the container according to claim 1 which joins two or more metal part segmenter, and changes Equip the circumference of said honeycomb structure object with said buffer member, and it holds in said container. the planar pressure which covers the range in which said buffer member exists at least, reduces the diameter of said container, holds said buffer member in the compression condition, and is given to said honeycomb structure object by the compression stability of said buffer member -- with, suppose that said honeycomb structure object is held in said container.

[0012] furthermore -- being according to claim 2 -- when [of two or more of said division objects / each] the end section is beforehand fabricated in a predetermined configuration at least and said two or more division objects are joined, it is [like] good to constitute the necking section to said container.

[0013] It is good to perform diameter reduction processing to claim 3 further like a publication, and to form in a predetermined end shape to the necking section of said container. Diameter reduction processing to the necking section of said container is good for the medial axis of said container and the medial axis of said necking section to perform spinning in the condition according to claim 4 of having the same axle, eccentricity, an inclination, and any one relation of the twist at least, and to form in a predetermined end shape like.

[0014] In the manufacture approach of the above-mentioned honeycomb structure

inside-of-the-body warehouse purge, it is good to supervise the planar pressure according to claim 5 given to said honeycomb structure object like, and to reduce the diameter of said container according to a monitor result.

[0015]

[Embodiment of the Invention] The manufacture approach of a catalytic converter is explained with reference to a drawing as the concrete 1 mode about the manufacture approach of a purge of holding a honeycomb structure object through a buffer member in the container which joins two or more metal part segmenter, and changes as mentioned above. First, as shown in drawing 2 , the side edge side of the metal part segmenter (half-object) 10a and 10b of the semicircle cross section of a pair is made to contact, and the cylinder-like preforming container 10 is formed, and the contact section is welded and it joins. As long as the welding process at this time is an approach that seal nature can be secured, which approaches, such as arc welding, laser welding, and plasma arc welding, are sufficient as it. The structure of a joint is good also as structure where the side edge section carries out the polymerization of the side edge section of the biparite segmenter 10a and 10c, and carries out fillet weld using division object 10c by which extension formation was carried out so that a polymerization may be carried out to the side edge section of division object 10a, as shown in drawing 3 besides the comparison structure shown in drawing 2 . Moreover, the appearance is [that what is necessary is just to set up the inside cross-section configuration according to the appearance of the honeycomb structure object 2 to hold] arbitrary although the preforming container 10 formed with this operation gestalt is cylindrical.

[0016] Next, as shown in drawing 1 , the buffer member 3 is further fixed to the periphery of the honeycomb structure object 2 which functions as catalyst support on an inflammable tape etc. winding and if needed. The one article 1 of drawing 1 is constituted by this. In this case, it is good to form heights and a crevice in the both ends of the buffer member 3, as shown in drawing 1 , and to use the general winding approach that these fit in mutually. Moreover, although illustration is omitted, since the buffer member beforehand formed in the shape of a cylinder also exists, a buffer member will be in the condition that the circumference of the honeycomb structure object 2 was equipped, and the one article 1 of drawing 1 will only consist of holding the honeycomb structure object 2 in a cylinder-like buffer member in that case. In this operation gestalt, the honeycomb structure object 2 does not ask the quality of the material and a process, although it consists of ceramics. Although the buffer member 3 is constituted from this operation gestalt by the alumina mat which does not almost have expansion by heat, it is good also as the buffer member of the vermiculite type of a thermal-expansion mold, and a buffer member which combined them. Moreover, the

inorganic fiber mat with which it does not sink in is sufficient as a binder. In addition, since planar pressure changes with the existence and the content of a binder, it is necessary to consider this in a planar pressure setup. Or the wire mesh which composed the metal thin line may be used, and it may be used combining a ceramic mat. Furthermore, you may combine with the retainer of the shape of them and a metal circular ring, the seal ring made from a wire mesh, etc.

[0017] Next, as shown in drawing 4 , while grasping the above-mentioned one article 1 between the clamp equipment CH of a pair and pressing the honeycomb structure object 2 through the buffer member 3 in the direction which intersects perpendicularly to the axis with the press object PM of a measuring device DT The planar pressure given to the honeycomb structure object 2 is detected, and the axis Z of the honeycomb structure object 2 in case this planar pressure serves as a predetermined value, and the distance L1 between the press objects PM are measured. And after returning [measurement and] the press object PM to a original location, grasping by clamp equipment CH is canceled. Hereafter, the clamp equipment CH and the measuring device DT which are used with this operation gestalt are explained.

[0018] Clamp equipment CH consists of collet chucks, the vertical edge of the honeycomb structure object 2 is pinched by this, and the axis Z is set to a predetermined measuring point. The measuring device DT of this operation gestalt is equipped with the location detection means slack rotary encoder RE arranged at the reaction force detection means slack press object PM supported through the load cell LC at the ball-screw type actuator AC and tip of a motor MT drive, and the back end. A load cell LC and the detection signal of a rotary encoder RE are inputted into an electronic control (henceforth a controller) CT, and while it is changed into the various below-mentioned data and memory (not shown) memorizes, Motor MT is constituted so that drive control may be carried out by Controller CT.

[0019] The press object PM moves in the direction (longitudinal direction of drawing 4) which intersects perpendicularly to the axis Z of the honeycomb structure object 2, and it is arranged so that this can be compressed after contacting the buffer member 3. Since the contact area of the press object PM is known, reaction force when the measuring object slack honeycomb structure object 2 and the buffer member 3 are pressed with this press object PM is detected by the load cell LC as planar pressure to the honeycomb structure object 2, and it is inputted into Controller CT. In Controller CT, the detection signal of a load cell LC is converted into a planar pressure value, is memorized by memory, and is compared with the predetermined planar pressure value inputted beforehand separately. Moreover, the amount of attitudes and halt location of the press object PM are detected by the rotary encoder RE as rotation information on a ball screw (not shown), and it is inputted into

Controller CT. In Controller CT, the detection signal of a rotary encoder RE is changed into the amount of attitudes of the press object PM, and the value of a halt location on real time, and is memorized by memory. In addition, between these detection means and Controllers CT, you may connect electrically and may connect optically.

[0020] By driving as follows the measuring device DT constituted as mentioned above, the relation between the axis Z of the honeycomb structure object 2, the distance between the press objects PM, and the planar pressure then given to the honeycomb structure object 2 can be measured. That is, the press object PM is advanced from an initial valve position (P0 point of drawing 4) (it moves leftward [of drawing 4]), a part of buffer member 3 is pressed, and a location (P1 point of drawing 4) when the compression reaction force of the buffer member 3 in the press section reaches a predetermined value is detected. This location (P1 point of drawing 4) is equivalent to the location of the internal surface of the preforming container 10 in case the planar pressure value of the buffer member 3 after becoming a product turns into a predetermined value (diameter reduction processing back). Therefore, the relation between the thrust given to the honeycomb structure object 2 and the reaction force (planar pressure) produced by it is beforehand memorized in the memory of Controller CT, the detection signal (reaction force) of a load cell LC is changed into a planar pressure value based on this relation, the press object PM is advanced to an above location (P1 point of drawing 4), comparing this with a predetermined planar pressure value, and the migration length of the press object PM is found.

[0021] It **. From the predetermined distance between the initial valve position (P0 point of drawing 4) at the tip of the press object PM, and the axis Z of the honeycomb structure object 2 If the migration length of the press object PM detected by the rotary encoder RE is deducted, the location at the tip of the press object PM (Namely, the distance L1 from Axis Z) can be judged, and this location will call it the location of the internal surface of the preforming container 10 in a product condition (namely, condition that the planar pressure to the honeycomb structure object 2 is held with the predetermined planar pressure value within the preforming container 10) (diameter reduction processing back). Thus, the location (P1 point of drawing 4) used as a predetermined planar pressure value can be judged, without using the so-called GBD value (it being the pack density of a buffer member and expressing with weight / restoration gap dimension per unit area), without measuring the dimension and characteristic value of the honeycomb structure object 2 and the buffer member 3 according to an individual according to this operation gestalt. That is, since the distance L1 between the axis Z of the above-mentioned honeycomb structure object 2 and the tip of the press object PM serves as a value which also took the error of

weight into consideration as a result per unit area of not only the outer-diameter error of the honeycomb structure object 2 but the buffer member 3, it does not need to measure these errors separately.

[0022] In addition, although it prepares for degree process and the memory of Controller CT memorizes, the above-mentioned distance L1 may be constituted so that it may display if needed. Moreover, it is good also as constituting so that two or more measuring devices DT are arranged to a radial, multipoint measurement is performed to the surroundings of the axis Z of the honeycomb structure object 2, or elegance 1 may clamp equipment CH and really be rotated (indexing) and multipoint measurement may be performed to the surroundings of Axis Z, and asking for the average of each measured value. Since it is necessary especially to perform multipoint measurement according to the configuration of the honeycomb structure object 2 when the honeycomb structure object 2 is not a circular cross section, it is desirable to arrange two or more measuring devices DT. It is not necessary to make it not necessarily stop by the position (P1 point of drawing 4), and the press object PM may be retreated continuously as it is after detecting this location, and further, it may be constituted so that grasping by clamp equipment CH may be made to cancel synchronizing with retreat of this press object PM.

[0023] As a planar pressure detection means, as a broken line shows, a pressure sensitive device PS may be infixed in drawing 4 between the honeycomb structure object 2 and the buffer member 3, and you may constitute so that planar pressure may be directly detected based on the detection signal of this pressure sensitive device PS. Since what detects pressure distribution on real time as this pressure sensitive device PS using the sensor sheet which has arranged the electrode in the shape of a matrix, for example is marketed, this may be used. Thus, if a planar pressure detection means is constituted, it is not necessary to find the above-mentioned distance L1 with a measuring device DT, beforehand, the diameter of the drum section containing the buffer member 3 of the preforming containers 10 can be reduced with the buffer member 3 so that said planar pressure may become in a predetermined pressure range, and it can constitute so that the honeycomb structure object 2 may be held. Therefore, production time can be shortened sharply. In addition, a pressure sensitive device PS is cheap, and if it does not have a bad influence on the function of a catalytic converter, it is good also as leaving it as it is, without extracting after sizing.

[0024] And as shown in drawing 1 , elegance 1 is really which equips with the buffer member 3 and grows into the circumference of the honeycomb structure object 2 held in the preforming container 10 which joins the division objects 10a and 10b of a pair, and changes, and it holds in a predetermined location. In this case, the pressure

welding of the external surface of the buffer member 3 is not carried out to the inside of the preforming container 10, but it is set as the relation of extent which does not contact or touches loosely, and, as for the buffer member 3, it is desirable to set up so that compressive force may hardly be received.

[0025] Next, to the preforming container 10 which really held elegance 1 as mentioned above, and was held in the predetermined location, sizing (sizing or calibrating) is performed and the diameter of the preforming container 10 is reduced to the path from which the buffer member 3 serves as the optimal amount of compression. Various approaches are learned as this sizing approach, for example, although a collet type (finger type) diameter reduction machine is common, spinning may be used for JP,2002-107725,A, for example like a publication. Springback is also taken into consideration, the diameter of the preforming container 10 and the buffer member 3 is reduced, and this diameter reduction section 11 turns into a drum section until the distance between the axis Z of the honeycomb structure object 2 and the internal surface of the preforming container 10 turns into distance L1 by this sizing so that it may be shown drawing 5 . In addition, it is good also as reducing the diameter of the preforming container 10, supervising planar pressure given to the honeycomb structure object 2 by the pressure sensitive device PS given in drawing 4 , for example (monitor). Consequently, between the external surface of the preforming container 10, and the external surface of the diameter reduction section 11, as shown in drawing 5 , a step 12 is formed.

[0026] Thus, since the range in which the buffer member 3 exists at least is covered and the diameter of the preforming container 10 is reduced, the buffer member 3 is held at a compression condition, and it is supported by the planar pressure given to the honeycomb structure object 2 by the compression stability where the honeycomb structure object 2 is stabilized within the diameter reduction section 11. It can hold in the diameter reduction section 11 appropriately also to the brittle honeycomb structure object 2 thereby especially, without destroying this.

[0027] And necking processing by spinning is performed as follows to the both ends of the preforming container 10 in which the honeycomb structure object 2 and the buffer member 3 were held as mentioned above. First, as shown in drawing 6 , the drum section (diameter reduction section 11) of the preforming container 10 is pinched with the clamp equipment CL for spinning equipments (illustration abbreviation), and is fixed to rotation impossible and shaft-orientations migration impossible. And to the shaft of the workpiece slack preforming container 10, it inclines, the shaft of Mandrel MN is arranged, and two or more spinning rollers SP which revolve the circumference of the periphery of the end section of the preforming container 10 around the sun by the circular locus of the diameter of said perform spinning to the end section of the

preforming container 10. That is, while sticking the spinning roller SP desirably arranged at equal intervals to the circumference of the periphery of the preforming container 10 to the peripheral face of the preforming container 10 and making it revolve around the sun, driving in the direction of a path and reducing a revolution locus, it drives to shaft orientations (right of drawing 6), and spinning is performed.

[0028] In addition, clamp equipment CL is good to use the mold corresponding to the diameter of adjustable which has an alignment function, for example, a collet chuck etc., so that it can respond to the diameter difference of a clamp part. Furthermore, although it is omitted, illustration is suitable, when it deduced (index), it also has the function and it does not form the necking section of both ends on the same flat surface in below-mentioned eccentricity / inclination necking processing. Moreover, the configuration precision of the bottleneck section 14 improves by performing necking processing with the spinning roller SP, where the mandrel MN which can move freely to shaft orientations as mentioned above is inserted in the edge of the preforming container 10. In addition, after performing necking processing at one edge of the preforming container 10 first, it is good also as forming the diameter reduction section 11, as shown in drawing 5 , and finally performing necking processing in the other-end section of the preforming container 10.

[0029] As it ** and is shown in the right-hand side of drawing 6 , necking processing is performed by the spinning roller SP so that the path of the preforming container 10 may decrease rapidly continuously from the diameter reduction section 11 of the preforming container 10, and the necking section slack taper section 13 and the bottleneck section 14 which have the shaft which inclined to the shaft of the diameter reduction section 11 in the end section of the preforming container 10 are formed. In this case, a smooth field is formed, without saving a level difference between the diameter reduction section 11 and the taper section 13. In addition, before performing this necking processing, as shown in drawing 5 , the step 12 is formed with diameter reduction of the preforming container 10.

[0030] Furthermore, the preforming container 10 processed as mentioned above is reversed 180 degrees, it arranges, and necking processing with the spinning roller SP is performed like [section / of the preforming container 10 / other-end] the above. In this case, with this operation gestalt, after process termination of drawing 6 , the reversal activity of the preforming container 10 which can be set releases the pinching condition of the preforming container 10 by clamp equipment CL, and is performed by picking out the preforming container 10 from clamp equipment CL, reversing this, and equipping clamp equipment CL again by the robot hand which is not illustrated. And the drum section of the preforming container 10 is again pinched with clamp equipment CL, and it is processed like the above-mentioned with the spinning roller

SP to the raw part on the left-hand side of drawing 6 , and as shown in drawing 7 , the taper section 15 and the bottleneck section 16 which have the shaft which carried out eccentricity to the shaft of the diameter reduction section 11 are formed.

[0031] It is indicated by the patent No. 2957153 official report and the patent No. 2957154 official report about the spinning approach containing an above-mentioned deflection axis and an above-mentioned axis of tilt, and these processing approaches can be applied to shaping of the edge of the preforming container 10.

[0032] Since the honeycomb structure object 2 held in the preforming container 10 and the buffer member 3 are not rotated during spinning, either, while being able to constitute easily the structure of holding the preforming container 10 certainly, since it **, and the preforming container 10 does not rotate at the time of spinning according to this operation gestalt (rotation centering on an axis), the stable maintenance condition is maintainable. Moreover, since necking processing to the both ends of the preforming container 10 can be performed continuously easily, floor to floor time can be shortened from the conventional approach.

[0033] And in this operation gestalt, the necking section which has the smooth field which followed the drum section 11 by necking processing with two or more spinning rollers SP can be formed. Since the spinning roller SP can remove this also when a step 12 (shown in drawing 5) is especially formed between a drum section 11 (diameter reduction section) and both ends at the time of diameter reduction of the preforming container 10, the smooth continuation side from a drum section to the necking section can be formed in an arbitration configuration. In addition, it is indicated by JP,2001-107725,A about removal of a step. It can form in the smooth field which continued the necking section (the taper section 13 and bottleneck section 14) which has an axis of tilt in left-hand side, and the necking section (the taper section 15 and bottleneck section 16) which has a deflection axis in right-hand side from the drum section 11, without forming a step like the finished product of the catalytic converter which it **, for example, is shown in drawing 7 .

[0034] Furthermore, the both ends of the preforming container 10 can be processed and the necking section (they are the taper section 15 and the bottleneck section 16 to the taper section 13 and the bottleneck section 14, and a list) can also be formed so that it may dare leave the step 12 formed at the time of diameter reduction of the preforming container 10 as shown in drawing 8 if needed. In addition, as shown in drawing 7 and drawing 8 , the spinning striation S remains in the taper sections 13 and 15 of the both sides of the finished product of the catalytic converter of this operation gestalt.

[0035] Drawing 9 thru/or drawing 12 show other operation gestalten of this invention, the end section is beforehand fabricated in a predetermined configuration at least, and

when [of two or more above-mentioned division objects / each] these are joined, it constitutes the necking section. That is, as shown in drawing 9 , the bottleneck sections 24a and 24b are beforehand formed in the taper sections 23a and 23b and the list which have the shaft which inclined to the shaft of the container after completion (shown in drawing 12) in each end section of the division objects 20a and 20b formed by press working of sheet metal. Moreover, the bottleneck sections 26a and 26b are beforehand formed in the taper sections 25a and 25b and the list which have the shaft which carried out eccentricity to the shaft of the container after completion, respectively in each other end of the division objects 20a and 20b.

[0036] And among the drum sections 21a and 21b of the above-mentioned division objects 20a and 20b, as shown in drawing 10 , elegance 1 is really which equips with the buffer member 3 and changes held, and weldbonding of the side edge side of the division objects 20a and 20b is carried out to the circumference of the honeycomb structure object 2. It ** and the preforming container 20 shown in drawing 11 is formed. In addition, since drawing 11 is the front view of the preforming container 20 seen from one division object 20a side, the amount of joint does not appear in drawing. Also in this case, the pressure welding of the external surface of the buffer member 3 is not carried out to the inside of the preforming container 20, but it is set as the relation of extent which does not contact or touches loosely, and, as for the buffer member 3, it is desirable to set up so that compressive force may hardly be received.

[0037] To the preforming container 20 formed as mentioned above, sizing is performed by the above-mentioned approach and the diameter of the preforming container 20 is reduced to the path from which the buffer member 3 serves as the optimal amount of compression. It **, as shown in drawing 12 , diameter reduction section 27a is formed, and Steps 22a and 22a are formed between this and both ends. In addition, also in this operation gestalt, it is good also as reducing the diameter of the preforming container 20, supervising planar pressure given to the honeycomb structure object 2 by the pressure sensitive device PS of a publication at drawing 4 (monitor).

[0038] Drawing 13 and drawing 14 decide to reduce a welding part by carrying out press working of sheet metal in the form which connected the division objects 20a and 20b which show the operation gestalt of further others of this invention, and are shown in drawing 9 . That is, as shown in drawing 13 , the preforming container 30 in the condition that the division objects 30a and 30b were joined by press working of sheet metal by side edge section 30c is formed. Also in this operation gestalt, the bottleneck sections 34a and 34b are beforehand formed in the taper sections 33a and 33b and the list which have the shaft which inclined to the shaft of the container after completion in each end section of the division objects 30a and 30b. Moreover, the bottleneck sections 36a and 36b are beforehand formed in the taper sections 35a and

35b and the list which have the shaft which carried out eccentricity to the shaft of the container after completion, respectively in each other end of the division objects 30a and 30b.

[0039] And among the drum sections 31a and 31b of the division objects 30a and 30b joined by side edge section 30c, as shown in drawing 14 , elegance 1 is really which equips with the buffer member 3 and changes held, and weldbonding of the side edge side of the division objects 30a and 30b is carried out to the circumference of the honeycomb structure object 2. Thereby, the preforming container 20 shown in drawing 11 and the same preforming container (not shown) are formed. Then, as shown in drawing 12 , sizing is performed, and the diameter of the preforming container 30 is reduced, and the diameter reduction section (and step) is formed. It ** and the same catalytic converter as drawing 12 is formed.

[0040] Although the necking section is constituted when the above-mentioned operation gestalt fabricates beforehand the end section of two or more division objects in a predetermined configuration and these are joined When it is difficult to fabricate the necking section in the condition of a division object in a final product configuration on a working limit As shown in drawing 15 and drawing 16 , the front stirrup of a sizing process can rework the edge of a preforming container (40 of drawing 15) behind, and can form the necking section of the last configuration. In this case, although various approaches are applicable to necking processing which can be set, work-piece fixed spinning is desirable in respect of the amount of permission diameter reduction, a shaping degree of freedom, processing ease, cost, etc.

[0041] Drawing 15 forms the preforming section (preforming section) 48 which has the medial axis which inclined to the drum section 41 at the time of shaping of the preforming container 40, is in the condition which clamped the drum section 41 firmly, reduces the diameter of the preforming section 48 by spinning, and decides to form the taper section 43 and the bottleneck section 44 of the last configuration. When the tilt angle of the medial axis Cs of the preforming section 48 to the medial axis (not shown) of a drum section 41 wants to mainly enlarge a diameter reduction rate for ** greatly, the coaxial spinning which performs spinning along with a medial axis Cs with the spinning roller (not shown) which sets the medial axis Cs of the preforming section 48 as a revolution core is suitable. In press working of sheet metal to the above-mentioned division object, although the preforming section 48 will become far from a desired configuration in many cases since there is much regulation on the configuration of the necking section, the degree of freedom (processing degree of freedom) of the configuration over the necking section improves sharply by the above spinning.

[0042] Furthermore, when forming the necking section of a complicated configuration

(for example, when you want to also enlarge a diameter reduction rate with a tilt angle), it is good to apply [patent / No. 2957154] the inclination spinning of a publication. Namely, as shown in drawing 16 , the preforming section (preforming section) 49 which has the medial axis Cp which inclined at the comparatively small include angle to the medial axis of a drum section 41 at the time of shaping of the preforming container 40 is formed. It is the approach of performing spinning along with a medial axis Ct, and forming the taper section 43 and the bottleneck section 44 of the last configuration with the spinning roller (not shown) which sets the medial axis Ct carried out as a revolution core, a predetermined include-angle beta inclination to the medial axis Cp of this preforming section 49. And like a patent [No. 2957154] publication, if two or more target processing shafts between a medial axis Cp and medial axes Ct are set up and it is made to perform spinning several times, since a working limit will spread, the degree of freedom (processing degree of freedom) of the configuration over the necking section improves further.

[0043] In addition, eccentric spinning given in the patent No. 2957153 official report as well as inclination spinning given in this patent No. 2957154 official report may be applied to the preforming section (preforming section). Furthermore, the medial axis of a drum section 41 and the medial axis of the bottleneck section 44 can form performing spinning in the condition of having the relation which combined the same axle, eccentricity, the inclination, and the twist (skew), then the necking section of a still more complicated configuration.

[0044] The appearance by which the catalytic converter shown in drawing 17 when eccentric spinning is performed after the preforming section (not shown) was formed in the other end side, while inclination spinning was performed after the preforming section 49 was formed in the end side, as it **(ed) and was shown in drawing 16 is formed, and the spinning striation S remains in a part of taper sections 43 and 45 of both sides will be presented. In addition, after forming the preforming section and forming a preforming container so that a step may not appear at the time of a sizing process, also when performing spinning to the preforming section further, as shown in drawing 18 , it becomes the appearance by which the spinning striation S remains in a part of taper sections 43 and 45 of both sides.

[0045] In addition, in the above-mentioned operation gestalt, although the cross section of the honeycomb structure object 2 is an approximate circle form, it is good also as noncircular sections, such as not only this but an ellipse form cross section, an ellipse cross section, a cross section that combined the field which has two or more curvatures, a polygon cross section, etc. Moreover, not only a honeycomb (hexagon) but the square of the passage (cel) cross section in the case of presenting catalyst support with the honeycomb structure object 2 etc. is arbitrary. Furthermore, it is not

necessary to be necessarily a piece, and the honeycomb structure object 2 may be arranged to two shaft orientations, and may be made into a tandem die, or may arrange three or more pieces to a serial, and the diameter of a drum section may be reduced for every part corresponding to each honeycomb structure object, and it may reduce the diameter of it continuously. And as a final product, the manufacture approach of not only the exhaust air system components of an automobile but this invention is applicable to various purges (not shown).

[0046]

[Effect of the Invention] Since this invention is constituted as mentioned above, it does the effectiveness of a publication so below. Namely, it sets to the manufacture approach of a honeycomb structure inside-of-the-body warehouse purge according to claim 1. In the container which joins two or more metal part segmenter, and changes, equip the circumference of a honeycomb structure object with a buffer member, and it is held. the planar pressure which covers the range in which a buffer member exists at least, reduces the diameter of a container, holds a buffer member in the compression condition, and is given to a honeycomb structure object by the compression stability of a buffer member — with, since a honeycomb structure object is held in a container While being able to hold a honeycomb structure object easily also to the container which joins a division object and changes, a buffer member covers the perimeter, generates homogeneity and sufficient compressive force, and can hold a honeycomb structure object in a container appropriately.

[0047] Furthermore, since the necking section can be beforehand formed in the phase of constituting the necking section like to each container of two or more division objects which fabricated the end section in the predetermined configuration beforehand at least, and joined these, then a division object according to claim 2, it can manufacture easily and cheaply.

[0048] Also when the necking section cannot be beforehand formed in the phase of a thing [performing diameter reduction processing further and forming in a predetermined end shape to the necking section of a container like,] according to claim 3, then a division object in addition to the above, it becomes possible to form a predetermined end shape easily by additional processing. Especially, to the necking section, diameter reduction processing can be performed easily, the degree of freedom of a configuration setup is large, and it also becomes possible a thing [performing spinning like] according to claim 4, then to form the necking section of a complicated configuration.

[0049] And reducing the diameter of a container like according to the planar pressure according to claim 5 given to a honeycomb structure object, then the purge which can hold a honeycomb structure object certainly by the optimal holding power can be

manufactured.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] In the manufacture approach concerning 1 operation gestalt of this invention, it is the perspective view showing the condition of really equipped the honeycomb structure object with the buffer member holding elegance in a preforming container.

[Drawing 2] In the manufacture approach concerning 1 operation gestalt of this invention, it is the perspective view showing the condition of joining the division object of a pair and forming a preforming container.

[Drawing 3] In the manufacture approach concerning 1 operation gestalt of this invention, it is the side elevation of the preforming container joined by other examples which join the division object of a pair.

[Drawing 4] In the manufacture approach concerning 1 operation gestalt of this invention, it is the front view showing a honeycomb structure object and the measurement process of a buffer member.

[Drawing 5] In the manufacture approach concerning 1 operation gestalt of this invention, it is the sectional view showing the diameter reduction condition of a preforming container.

[Drawing 6] It is the sectional view showing the spinning condition over the end section in the manufacture approach concerning 1 operation gestalt of this invention.

[Drawing 7] In the manufacture approach concerning 1 operation gestalt of this invention, it is the front view showing an example of the finished product of the catalytic converter in which the necking section was formed to the both ends of a preforming container.

[Drawing 8] In the manufacture approach concerning 1 operation gestalt of this invention, it is the front view showing an example of the finished product of the catalytic converter which formed the necking section to the both ends of a preforming container so that it might leave a step between a drum section and both ends.

[Drawing 9] In the manufacture approach concerning other operation gestalten of this invention, it is the perspective view showing the condition before fabricating the both ends of the division object of a pair in a predetermined configuration beforehand and joining these.

[Drawing 10] In the manufacture approach concerning other operation gestalten of this invention, it is the perspective view fabricating the both ends of the division

object of a pair in a predetermined configuration beforehand, and showing among these the condition of really equipped with a buffer member holding elegance on a honeycomb structure object.

[Drawing 11] In the manufacture approach concerning other operation gestalten of this invention, it is the front view really equipped the honeycomb structure object with the buffer member showing an example of the preforming container which held elegance in the division object of a pair and was joined.

[Drawing 12] In the manufacture approach concerning other operation gestalten of this invention, it is the front view showing the condition of having reduced the diameter of the part which held the honeycomb structure object of the preforming container of drawing 11 .

[Drawing 13] In the manufacture approach concerning the operation gestalt of further others of this invention, it is the perspective view showing the condition before fabricating the both ends of the division object of a pair in a predetermined configuration beforehand and joining these.

[Drawing 14] In the manufacture approach concerning the operation gestalt of further others of this invention, it is the perspective view fabricating the both ends of the division object of a pair in a predetermined configuration beforehand, and showing among these the condition of really equipped with a buffer member holding elegance on a honeycomb structure object.

[Drawing 15] In the manufacture approach concerning the operation gestalt of further others of this invention, it is the partial front view showing an example in the condition of reworking the edge of a preforming container and forming the necking section of the last configuration.

[Drawing 16] In the manufacture approach concerning the operation gestalt of further others of this invention, it is the partial front view showing other examples in the condition of reworking the edge of a preforming container and forming the necking section of the last configuration.

[Drawing 17] In the manufacture approach concerning the operation gestalt of further others of this invention, after the preforming section is formed, it is the front view showing the catalytic converter with which spinning was performed.

[Drawing 18] In the manufacture approach concerning the operation gestalt of further others of this invention, after the preforming section is formed so that a step may not appear, it is the front view showing the catalytic converter with which spinning was performed.

[Description of Notations]

1 One Article, Step, DT Measuring Device, PM Press Object, LC Load Cell, RE Rotary Encoder, CH Clamp Equipment, SP Spinning Roller 2 Honeycomb Structure Object 3

Buffer Member, 10, 20, 30, 40 Preforming Container 10a, 10B 13 Division Object, 15 Taper Section 14 16 Bottleneck Section 12

[Translation done.]

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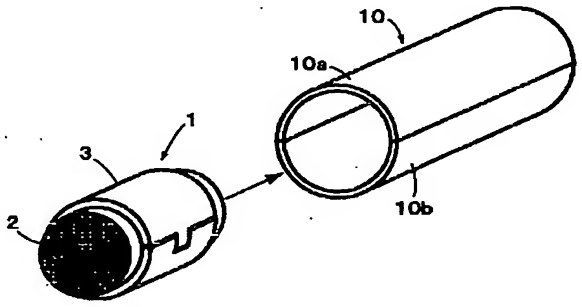
最終頁に続く

(54)【発明の名称】　ハニカム構造体内蔵浄化装置の製造方法

(57)【要約】
【課題】　複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持する浄化装置の製造方法において、ハニカム構造体を適切に容器内に保持すると共に、緩衝部材が全周に亘って均一且つ十分な圧縮力を発生し維持し得るようにする。
【解決手段】　複数の金属製分割体（１０ａ，１０ｂ）を接合して成る容器（１０）内に、緩衝部材（３）をハニカム構造体（２）周りに装着して収容し、少なくとも緩衝部材の存在する範囲に亘って容器を縮径して緩衝部材を圧縮状態に保持し、緩衝部材の圧縮復元力によってハニカム構造体に付与される面圧を以てハニカム構造体を容器内に保持する。複数の分割体の各々の少なくとも一端部を予め所定の形状に成形し、複数の分割体を接合したときに容器に対し、例えばスピニング加工によってネッキング部を構成するとよい。



【特許請求の範囲】
【請求項１】　複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持するハニカム構造体内蔵浄化装置の製造方法において、前記緩衝部材を前記ハニカム構造体周りに装着して、前記容器内に収容し、少なくとも前記緩衝部材の存在する範囲に亘って前記容器を縮径して前記緩衝部材を圧縮状態に保持し、前記緩衝部材の圧縮復元力によって前記ハニカム構造体に付与される面圧を以て前記ハニカム構造体を前記容器内に保持することを特徴とするハニカム構造体内蔵浄化装置の製造方法。
【請求項２】　前記複数の分割体の各々の少なくとも一端部を予め所定の形状に成形し、前記複数の分割体を接合したときに前記容器に対しネッキング部を構成することを特徴とする請求項１記載のハニカム構造体内蔵浄化装置の製造方法。
【請求項３】　前記容器のネッキング部に対し、縮径加工を行い所定の端部形状に形成することを特徴とする請求項２記載のハニカム構造体内蔵浄化装置の製造方法。
【請求項４】　前記容器のネッキング部に対する縮径加工は、前記容器の中心軸と前記ネッキング部の中心軸とが、少なくとも同軸、偏芯、傾斜及び捩れの何れか一つの関係にある状態でスピニング加工を行ない所定の端部形状に形成することを特徴とする請求項３記載のハニカム構造体内蔵浄化装置の製造方法。
【請求項５】　前記ハニカム構造体に付与される面圧を監視し、監視結果に応じて前記容器を縮径することを特徴とする請求項１又は２記載のハニカム構造体内蔵浄化装置の製造方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持する浄化装置の製造方法に関し、例えば、同容器内に緩衝マットを介してハニカム構造体の触媒担体を保持する触媒コンバータの製造方法として好適な製造方法に係る。
【０００２】
【従来の技術】流体に対してフィルタ機能を有するハニカム構造体が、金属製容器内に緩衝部材を介して内蔵された浄化装置が知られており、種々の流体の浄化に供されている。例えば、自動車の排気系においては触媒コンバータやディーゼルパティキュレートフィルタ（以下、ＤＰフィルタという）が搭載されており、触媒担体（あるいはフィルタ）としてセラミック製の脆弱なハニカム構造体が用いられている。このような浄化装置の製造方法として、上記のハニカム構造体の外周に、シール機能を有する緩衝部材としてセラミック製の緩衝マットを巻回し、これらを、複数の金属製分割体（所謂、半体）から成る金属容器内に収容し保持する方法（通称、最中合わせ）が普及している。
【０００３】ハニカム触媒コンバータの製造方法に関し、例えば特開昭５６－６４１１６号公報においては、触媒コンバータの両側端のフランジのみを押えて触媒コンバータを組み立てると、各ケースのフランジに近い両側部分は強く押されるため、保持材が強く圧縮されるが、フランジから離れた中央部分は保持材が充分に圧縮されず、結果としてケースの断面形状が歪んで保持材の圧縮状態が不同になってしまうことを問題として、上型と下型との間で上下両ケースのフランジを挟持すると同時に上下両ケースの中央部を押圧し、該両フランジを溶着する方法が提案されている。
【０００４】また、特開昭５９－１３８７１５号公報には、板状の弾性保持部材を予めその厚さ方向に圧縮した後、その外周に２つ割りケーシングのケーシング半体を、触媒担体を挟むように互いに寄り合せてそれらを合掌結合するようにした触媒コンバータの組付方法が提案されている。これにより、２つ割りケーシング間に弾性保持部材が噛込んだり、弾性保持部材の衝合端面が互いに離間するといった不都合を生起する心配がないとしている。
【０００５】更に、特開平９－１１２２６０号公報においては、円筒形をなし、且つ触媒を担持した触媒担体と、その触媒担体の外周面に巻かれた保持マットと、その保持マットを圧縮した状態で前記触媒担体を保持する円筒形担体保持部を備えたケーシングとより構成され、前記円筒形担体保持部は、径方向二つ割の両半体の、軸線方向に延びる両側縁部を相互に嵌め合せて両嵌め合せ部分を接合された組立体である触媒コンバータにおいて、前記円筒形担体保持部は、前記両嵌め合せ部分間を長径とする横断面オーバル形をなす触媒コンバータが提案されている。そして、円筒形担体保持部の横断面形状を前記のように特定すると、各半体が円弧状内周面を有する場合よりも、各半体における両側縁部間の間隔を拡げると共に各半体の内周面をなだらかにすることが可能であるから、両半体により触媒担体を挟着する過程で、各半体の両側縁部の保持マット外周面への食込み量を減らすと共に保持マット外周面に対する各半体内周面の摩擦力を低めて保持マットに対する引張りを緩和することができると記載されている。
【０００６】また、特開平１０-４７０４６号公報においては、セラミック製触媒コンバータに関し、外筒は軸方向に沿った分割線にて少なくとも一箇所以上分割され、分割線に沿って一対の分割端部が形成されており、一対の分割端部の少なくとも一方には、他方の分割端部と接触し、溶接されるための変形可能な変形機構が設けられ、この変形機構の変形により、セラミック製触媒担体及び外筒の大きさのバラツキを吸収することができると記載されている。そして、組み立て方法に関し、「セラミック製触媒担体に対し、保持材を巻回し、被覆体と

なす。その後、上記被覆体に対し外筒を組付け、上記保持材が一定の保持面圧を発生するまで、上記外筒を外部より押圧する。その後、変形機構を設けた分割端部を他方の分割端部に対し押しつけ、両者を溶接する」旨記載されている。

【０００７】

【発明が解決しようとする課題】ここで、ハニカム構造体を金属製容器内の所定位置に保持するために必要とされる保持力について説明すると、金属製容器の径方向の保持力は、ハニカム構造体の外面及び金属製容器の内面に対し直交する方向に働く緩衝部材の圧縮復元力である。一方、例えば自動車の排気装置に固定された金属製容器に対し、ハニカム構造体及び緩衝部材には振動や排気ガス圧力によって軸方向の力が生ずるので、これに抗する力としてハニカム構造体の軸方向（長手方向）の保持力が必要であり、これは緩衝部材とハニカム構造体との間の摩擦力、及び緩衝部材と金属製容器との間の摩擦力が資するところとなる。

【０００８】この場合において、ハニカム構造体の外径誤差に起因する面圧のバラツキを考慮し、あるいは車両に搭載したときの加速度によるハニカム構造体の移動を抑止し得る面圧の発生を考慮した上で、面圧、即ち圧縮力をなるべく強く、且つ周方向に均一に付与することが望ましい。しかし、圧縮力を過大に設定すると、及び／又は周方向で不均一に（バラツキ大に）設定すると、ハニカム構造体が破損するおそれが大となるので、圧縮力を所定値より大とすることはできない。また、圧縮力を大とするためには緩衝部材の圧縮量を大きく設定しなければならず、厚い緩衝部材をハニカム構造体と容器との間に収容することは容易ではない。特に、複数の金属製分割体（半体）から成る金属容器内に収容する方法においては、分割体が相互に近接する方向の圧縮力しか作用させることができないので、全周に亘って均一な圧縮力を得ることは構造上、不可能である。

【０００９】前掲の特開昭５９－１３８７１５号公報においては、弾性保持部材を予めその厚さ方向に圧縮した後、触媒担体を挟むようにケーシング半体を合掌結合する組付方法が提案されているが、これによって組付が容易となるものの上記の課題を解決し得るものではない。一方、前掲の特開平９－１１２２６０号公報及び特開平１０－４７０４６号公報においては、全周に亘って均一な圧縮力を得ることが企図されているが、何れも、構造上、割面に平行な方向の圧縮力を十分確保し得るものではない。特に、特開平１０－４７０４６号公報に記載のように、変形機構といった剛性が弱い部分を設けることは、全周に亘って十分な圧縮力を確保するという要請に反するものであり、上記の課題を解決し得るものではない。

【００１０】そこで、本発明は、複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持するハニカム構造体内蔵浄化装置の製造方法において、ハニカム構造体を適切に容器内に保持すると共に、緩衝部材が全周に亘って均一且つ十分な圧縮力を発生し維持し得る製造方法を提供することを課題とする。

【００１１】

【課題を解決するための手段】上記課題を解決するため、本発明のハニカム構造体内蔵浄化装置の製造方法は、請求項１に記載のように、複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持するハニカム構造体内蔵浄化装置の製造方法において、前記緩衝部材を前記ハニカム構造体周りに装着して、前記容器内に収容し、少なくとも前記緩衝部材の存在する範囲に亘って前記容器を縮径して前記緩衝部材を圧縮状態に保持し、前記緩衝部材の圧縮復元力によって前記ハニカム構造体に付与される面圧を以て前記ハニカム構造体を前記容器内に保持することとしたものである。

【００１２】更に、請求項２に記載のように、前記複数の分割体の各々の少なくとも一端部を予め所定の形状に成形し、前記複数の分割体を接合したときに前記容器に対しネッキング部を構成するとよい。

【００１３】前記容器のネッキング部に対し、請求項３に記載のように、更に縮径加工を行い所定の端部形状に形成するとよい。前記容器のネッキング部に対する縮径加工は、請求項４に記載のように、前記容器の中心軸と前記ネッキング部の中心軸とが、少なくとも同軸、偏芯、傾斜及び捩れの何れか一つの関係にある状態でスピニング加工を行ない所定の端部形状に形成するとよい。

【００１４】上記のハニカム構造体内蔵浄化装置の製造方法において、請求項５に記載のように、前記ハニカム構造体に付与される面圧を監視し、監視結果に応じて前記容器を縮径するとよい。

【００１５】

【発明の実施の形態】上記のように複数の金属製分割体を接合して成る容器内に、緩衝部材を介してハニカム構造体を保持する浄化装置の製造方法に関し、その具体的一態様として、触媒コンバータの製造方法について図面を参照して説明する。先ず、図２に示すように、一対の半円断面の金属製分割体（半体）１０ａ，１０ｂの側端面を当接させて円筒状の中間加工容器１０を形成し、当接部を溶接して接合する。このときの溶接方法は、シール性を確保し得る方法であれば、アーク溶接、レーザ溶接、プラズマ溶接等、何れの方法でもよい。接合部の構造は、図２に示す突き合わせ構造のほか、図３に示すように、分割体１０ａの側端部に重合するように側端部が延出形成された分割体１０ｃを用い、両分割体１０ａ，１０ｃの側端部を重合させて隅肉溶接する構造としてもよい。また、本実施形態で形成される中間加工容器１０は円筒状であるが、その内側断面形状は、収容するハニカム構造体２の外形に応じて設定すればよく、また、外

形は任意である。

【００１６】次に、図１に示すように、触媒担体として機能するハニカム構造体２の外周に緩衝部材３を一層巻回し、必要に応じ可燃性テープ等によって固定する。これによって、図１の一体品１が構成される。この場合において、緩衝部材３の両端には図１に示すように凸部と凹部を形成しておき、これらが相互に嵌合する一般的な巻回方法を用いるとよい。また、図示は省略するが、予め円筒状に形成された緩衝部材も存在するので、その場合には円筒状の緩衝部材内にハニカム構造体２を収容するだけで、緩衝部材がハニカム構造体２周りに装着された状態となり、図１の一体品１が構成される。本実施形態においては、ハニカム構造体２はセラミックスで構成されているが、材質、製法は問わない。緩衝部材３は、本実施形態では熱による膨張が殆どないアルミナマットで構成されているが、熱膨張型のバーミキュライト式の緩衝部材や、それらを組み合わせた緩衝部材としてもよい。また、バインダーが含浸されていない無機質繊維マットでもよい。尚、バインダーの有無及び含有量によって面圧が変わるので、面圧設定においてはこれを加味する必要がある。あるいは、金属細線を編成したワイヤメッシュ等を用いてもよいし、それをセラミックマットと組み合わせて使用してもよい。更に、それらと金属円環状のリテーナや、ワイヤメッシュ製のシールリング等と組み合わせてもよい。

【００１７】次に、図４に示すように、上記の一体品１を一対のクランプ装置ＣＨ間に把持し、測定装置ＤＴの押圧体ＰＭによって、緩衝部材３を介してハニカム構造体２をその軸芯に対して直交する方向に押圧すると共に、ハニカム構造体２に付与される面圧を検知し、該面圧が所定の値となるときの、ハニカム構造体２の軸芯Ｚと押圧体ＰＭとの間の距離Ｌ１を測定する。そして、測定後、押圧体ＰＭを原位置に復帰させた後、クランプ装置ＣＨによる把持を解除する。以下、本実施形態で用いるクランプ装置ＣＨ及び測定装置ＤＴについて説明する。

【００１８】クランプ装置ＣＨは、例えばコレットチャックで構成され、これによってハニカム構造体２の上下端部が挟持されてその軸芯Ｚが所定の測定位置にセットされる。本実施形態の測定装置ＤＴは、モータＭＴ駆動のボールスクリュー式アクチュエータＡＣと、その先端にロードセルＬＣを介して支持された反力検知手段たる押圧体ＰＭと、後端に配置された位置検知手段たるロータリエンコーダＲＥを備えている。ロードセルＬＣ及びロータリエンコーダＲＥの検知信号は電子制御装置（以下、コントローラという）ＣＴに入力され、後述の各種データに変換されてメモリ（図示せず）に記憶されると共に、モータＭＴはコントローラＣＴによって駆動制御されるように構成されている。

【００１９】押圧体ＰＭはハニカム構造体２の軸芯Ｚに対して直交する方向（図４の左右方向）に進退し、緩衝部材３に当接後これを圧縮し得るように配置される。押圧体ＰＭの当接面積は既知であるので、この押圧体ＰＭによって測定対象たるハニカム構造体２及び緩衝部材３が押圧されたときの反力が、ハニカム構造体２に対する面圧としてロードセルＬＣによって検知され、コントローラＣＴに入力される。コントローラＣＴにおいては、ロードセルＬＣの検知信号が面圧値に換算されてメモリに記憶され、別途予め入力された所定の面圧値と比較される。また、ロータリエンコーダＲＥによって押圧体ＰＭの進退量及び停止位置がボールスクリュー（図示せず）の回転情報として検知され、コントローラＣＴに入力される。コントローラＣＴにおいては、ロータリエンコーダＲＥの検知信号がリアルタイムで押圧体ＰＭの進退量及び停止位置の値に変換されてメモリに記憶される。尚、これらの検知手段とコントローラＣＴとの間は電気的に接続してもよいし光学的に接続してもよい。

【００２０】上記のように構成された測定装置ＤＴを以下のように駆動することによって、ハニカム構造体２の軸芯Ｚと押圧体ＰＭとの間の距離と、そのときにハニカム構造体２に付与される面圧との関係を測定することができる。即ち、押圧体ＰＭを初期位置（図４のＰ０点）から前進（図４の左方向に移動）させて緩衝部材３の一部を押圧し、押圧部における緩衝部材３の圧縮反力が所定の値に到達したときの位置（図４のＰ１点）を検出する。この位置（図４のＰ１点）は、製品となった後の緩衝部材３の面圧値が所定の値となるときの、中間加工容器１０の（縮径加工後の）内壁面の位置に相当する。従って、ハニカム構造体２に付与される押圧力とそれによって生ずる反力（面圧）との関係を、予めコントローラＣＴのメモリに記憶しておき、この関係に基づきロードセルＬＣの検知信号（反力）を面圧値に変換し、これと所定の面圧値とを比較しながら押圧体ＰＭを上記の位置（図４のＰ１点）まで前進させ、押圧体ＰＭの移動距離を求める。

【００２１】而して、押圧体ＰＭの先端の初期位置（図４のＰ０点）とハニカム構造体２の軸芯Ｚとの間の所定距離から、ロータリエンコーダＲＥによって検知される押圧体ＰＭの移動距離を差し引けば押圧体ＰＭの先端の位置（即ち、軸芯Ｚからの距離Ｌ１）を判定することができ、この位置が、製品状態（即ち、中間加工容器１０内でハニカム構造体２に対する面圧が所定の面圧値で保持されている状態）における中間加工容器１０の（縮径加工後の）内壁面の位置ということになる。このように、本実施形態によればハニカム構造体２及び緩衝部材３の寸法や特性値を個別に測定することなく、また所謂ＧＢＤ値（緩衝部材の充填密度であり、単位面積当り重量／充填間隙寸法で表す）を用いることもなく、所定の面圧値となる位置（図４のＰ１点）を判定することができる。即ち、上記のハニカム構造体２の軸芯Ｚと押圧体

PMの先端との間の距離Ｌ１は、結果的にハニカム構造体２の外径誤差のみならず緩衝部材３の単位面積当り重量の誤差をも考慮した値となるので、これらの誤差を別途測定する必要はない。

【００２２】尚、上記の距離Ｌ１は、次工程に備え、コントローラＣＴのメモリに記憶されるが、必要に応じて表示するように構成してもよい。また、ハニカム構造体２の軸芯Ｚの回りに放射状に複数の測定装置ＤＴを配置し多点測定を行ない、あるいは、軸芯Ｚの回りにクランプ装置ＣＨ及び一体品１を回動（割り出し）させて多点測定を行なうように構成し、各測定値の平均を求めることとしてもよい。特に、ハニカム構造体２が円形断面でない場合には、ハニカム構造体２の形状に応じて多点測定を行なう必要があるので、複数の測定装置ＤＴを配置することが望ましい。押圧体ＰＭは、必ずしも所定の位置（図４のＰ１点）で停止させる必要はなく、この位置を検知後そのまま連続して後退させ、更に、この押圧体ＰＭの後退に同期してクランプ装置ＣＨによる把持を解除させるように構成してもよい。

【００２３】面圧検知手段としては、図４に破線で示すように、ハニカム構造体２と緩衝部材３との間に感圧素子ＰＳを介装し、この感圧素子ＰＳの検知信号に基づき面圧を直接検知するように構成してもよい。この感圧素子ＰＳとしては、例えば、マトリックス状に電極を配置したセンサシートを利用して圧力分布をリアルタイムで検出するものが市販されているので、これを用いてもよい。このように面圧検知手段を構成すれば、予め測定装置ＤＴによって前述の距離Ｌ１を求める必要はなく、中間加工容器１０のうちの緩衝部材３を含む胴部を、前記面圧が所定の圧力範囲内となるように緩衝部材３と共に縮径してハニカム構造体２を保持するように構成することができる。従って、製造時間を大幅に短縮することができる。尚、感圧素子ＰＳが安価で、且つ、触媒コンバータの機能に悪影響を与えないのであれば、サイジング後に抜き出すことなくそのまま放置することとしてもよい。

【００２４】そして、図１に示すように、一対の分割体１０ａ，１０ｂを接合して成る中間加工容器１０内に、ハニカム構造体２周りに緩衝部材３を装着して成る一体品１を収容し、所定位置に保持する。この場合において、緩衝部材３の外面は中間加工容器１０の内面に圧接されず、接触しないか、あるいは、緩く接触している程度の関係に設定し、緩衝部材３は殆ど圧縮力を受けないように設定することが望ましい。

【００２５】次に、上記のように一体品１を収容し所定位置に保持した中間加工容器１０に対し、サイジング（sizing又はcalibrating）を行い、緩衝部材３が最適圧縮量となる径まで中間加工容器１０を縮径する。このサイジング方法としては種々の方法が知られており、例えばコレット式（フィンガ式）縮径機が一般的であるが、例えば特開２００２－１０７７２５号に記載のようにスピニング加工を用いてもよい。このサイジングにより、図５示すように、ハニカム構造体２の軸芯Ｚと中間加工容器１０の内壁面との間の距離が距離Ｌ１となるまで、スプリングバックも考慮して中間加工容器１０及び緩衝部材３が縮径され、この縮径部１１が胴部となる。尚、例えば図４に記載の感圧素子ＰＳによって、ハニカム構造体２に付与される面圧を監視（モニター）しながら、中間加工容器１０を縮径することとしてもよい。この結果、中間加工容器１０の外面と縮径部１１の外面との間には、図５に示すように段部１２が形成される。

【００２６】このように、少なくとも緩衝部材３の存在する範囲に亘って中間加工容器１０が縮径されるので、緩衝部材３が圧縮状態に保持され、その圧縮復元力によってハニカム構造体２に付与される面圧によって、ハニカム構造体２が縮径部１１内で安定した状態で支持される。これにより、特に脆弱なハニカム構造体２に対しても、これを破壊することなく適切に縮径部１１内に保持することができる。

【００２７】そして、上記のようにハニカム構造体２及び緩衝部材３が収容された中間加工容器１０の両端部に対し、以下のようにスピニングによるネッキング加工が行なわれる。先ず、中間加工容器１０の胴部（縮径部１１）を、図６に示すように、スピニング装置（図示省略）用のクランプ装置ＣＬによって挟持し、回転不能且つ軸方向移動不能に固定する。そして、被加工物たる中間加工容器１０の軸に対しマンドレルＭＮの軸を傾斜して配置し、中間加工容器１０の一端部の外周回りを同径の円形軌跡にて公転する複数のスピニングローラＳＰによって、中間加工容器１０の一端部に対しスピニング加工を行なう。即ち、中間加工容器１０の外周回りに望ましくは等間隔で配置したスピニングローラＳＰを、中間加工容器１０の外周面に密着させて公転させると共に、径方向に駆動して公転軌跡を縮小しつつ軸方向（図６の右方向）に駆動してスピニング加工を行なう。

【００２８】尚、クランプ装置ＣＬは、クランプ部分の径差に対応できるように、調心機能を有する可変径対応型、例えばコレットチャック等を用いるとよい。更に、図示は省略するが、割出し（インデックス）機能も備えており、後述の偏芯／傾斜ネッキング加工において両端のネッキング部を同一平面上に形成しない場合に好適である。また、上記のように軸方向に進退自在のマンドレルＭＮを中間加工容器１０の端部に挿入した状態でスピニングローラＳＰによってネッキング加工を行なうことにより、ボトルネック部１４の形状精度が向上する。

尚、最初に中間加工容器１０の一方の端部にネッキング加工を行なった後、図５に示すように縮径部１１を形成し、最後に中間加工容器１０の他方の端部にネッキング加工を行なうこととしてもよい。

【００２９】而して、図６の右側に示すように、中間加

工容器１０の縮径部１１から連続して中間加工容器１０の径が急減するようにスピニングローラＳＰによってネッキング加工が行なわれ、中間加工容器１０の一端部に、縮径部１１の軸に対し傾斜した軸を有するネッキング部たるテーパ部１３及びボトルネック部１４が形成される。この場合には、縮径部１１とテーパ部１３との間に段差が残置されることなく、滑らかな面が形成される。尚、このネッキング加工を行なう前は、図５に示すように、中間加工容器１０の縮径に伴い段部１２が形成されている。

【００３０】更に、上記のように加工された中間加工容器１０を１８０度反転させて配置し、中間加工容器１０の他方の端部についても上記と同様にスピニングローラＳＰによるネッキング加工を行なう。この場合における中間加工容器１０の反転作業は、本実施形態では図６の工程終了後、クランプ装置ＣＬによる中間加工容器１０の挟持状態を解放し、図示しないロボットハンドによってクランプ装置ＣＬから中間加工容器１０を取り出し、これを反転させて再度クランプ装置ＣＬに装着することによって行なう。そして、クランプ装置ＣＬによって中間加工容器１０の胴部を再度挟持し、図６の左側の未加工部分に対し、スピニングローラＳＰによって前述と同様に加工し、図７に示すように、縮径部１１の軸に対し偏芯した軸を有するテーパ部１５及びボトルネック部１６を形成する。

【００３１】上記の偏芯軸及び傾斜軸を含むスピニング加工方法については特許第２９５７１５３号公報及び特許第２９５７１５４号公報に開示されており、これらの加工方法を中間加工容器１０の端部の成形に適用することができる。

【００３２】而して、本実施形態によれば、スピニング加工時に中間加工容器１０は回転しないため、中間加工容器１０を確実に保持する構造を容易に構成することができると共に、中間加工容器１０に収容されたハニカム構造体２及び緩衝部材３もスピニング加工中に回転（軸芯を中心とする自転）することはないので、安定した保持状態を維持することができる。また、中間加工容器１０の両端部に対するネッキング加工を容易に連続して行なうことができるので、従来方法より加工時間を短縮することができる。

【００３３】しかも、本実施形態においては、複数のスピニングローラＳＰによるネッキング加工によって、胴部１１に連続した滑らかな面を有するネッキング部を形成することができる。特に、中間加工容器１０の縮径時に胴部１１（縮径部）と両端部との間に段部１２（図５に示す）が形成されたときにも、これをスピニングローラＳＰによって除去することができるので、胴部からネッキング部に至る滑らかな連続面を任意形状に形成することができる。尚、段部の除去に関しては特開２００１－１０７７２５号公報に開示されている。而して、例えば図７に示す触媒コンバータの完成品のように、左側には傾斜軸を有するネッキング部（テーパ部１３及びボトルネック部１４）、右側には偏芯軸を有するネッキング部（テーパ部１５及びボトルネック部１６）を、段部を形成することなく、胴部１１から連続した滑らかな面に形成することができる。

【００３４】更に、必要に応じて、図８に示すように中間加工容器１０の縮径時に形成される段部１２を敢えて残すように、中間加工容器１０の両端部を加工してネッキング部（テーパ部１３及びボトルネック部１４、並びにテーパ部１５及びボトルネック部１６）を形成することもできる。尚、図７及び図８に示すように、本実施形態の触媒コンバータの完成品の両側のテーパ部１３及び１５には、スピニング条痕Ｓが残る。

【００３５】図９乃至図１２は本発明の他の実施形態を示すもので、上記複数の分割体の各々の少なくとも一端部を予め所定の形状に成形し、これらを接合したときにネッキング部を構成するものである。即ち、図９に示すように、プレス加工で形成する分割体２０ａ及び２０ｂの各々の一端部に、完成後の容器（図１２に示す）の軸に対し傾斜した軸を有するテーパ部２３ａ及び２３ｂ、並びにボトルネック部２４ａ及び２４ｂが予め形成されている。また、分割体２０ａ及び２０ｂの各々の他端部には、夫々、完成後の容器の軸に対し偏芯した軸を有するテーパ部２５ａ及び２５ｂ、並びにボトルネック部２６ａ及び２６ｂが予め形成されている。

【００３６】そして、上記の分割体２０ａ及び２０ｂの胴部２１ａ及び２１ｂの間に、図１０に示すように、ハニカム構造体２周りに緩衝部材３を装着して成る一体品１を収容し、分割体２０ａ及び２０ｂの側端面を溶接接合する。而して、図１１に示す中間加工容器２０が形成される。尚、図１１は一方の分割体２０ａ側からみた中間加工容器２０の正面図であるので、接合部分は図には表れていない。この場合においても、緩衝部材３の外面は中間加工容器２０の内面に圧接されず、接触しないか、あるいは、緩く接触している程度の関係に設定し、緩衝部材３は殆ど圧縮力を受けないように設定することが望ましい。

【００３７】上記のように形成した中間加工容器２０に対し、前述の方法によりサイジングを行い、緩衝部材３が最適圧縮量となる径まで中間加工容器２０を縮径する。而して、図１２に示すように縮径部２７ａが形成され、これと両端部との間には段部２２ａ，２２ａが形成される。尚、本実施形態においても、図４に記載の感圧素子ＰＳによって、ハニカム構造体２に付与される面圧を監視（モニター）しながら、中間加工容器２０を縮径することとしてもよい。

【００３８】図１３及び図１４は本発明の更に他の実施形態を示すもので、図９に示す分割体２０ａ及び２０ｂを連結した形でプレス加工することにより、溶接箇所を

低減することとしたものである。即ち、図１３に示すように、プレス加工によって分割体３０ａ及び３０ｂが側端部３０ｃで接合された状態の中間加工容器３０が形成される。本実施形態においても、分割体３０ａ及び３０ｂの各々の一端部に、完成後の容器の軸に対し傾斜した軸を有するテーパ部３３ａ及び３３ｂ、並びにボトルネック部３４ａ及び３４ｂが予め形成されている。また、分割体３０ａ及び３０ｂの各々の他端部には、夫々、完成後の容器の軸に対し偏芯した軸を有するテーパ部３５ａ及び３５ｂ、並びにボトルネック部３６ａ及び３６ｂが予め形成されている。

【００３９】そして、側端部３０ｃで接合された分割体３０ａ及び３０ｂの胴部３１ａ及び３１ｂの間に、図１４に示すように、ハニカム構造体２周りに緩衝部材３を装着して成る一体品１を収容し、分割体３０ａ及び３０ｂの側端面を溶接接合する。これにより、図１１に示す中間加工容器２０と同様の中間加工容器（図示せず）が形成される。この後、図１２に示すようにサイジングを行い、中間加工容器３０を縮径し、縮径部（及び段部）を形成する。而して、図１２と同様の触媒コンバータが形成される。

【００４０】上記の実施形態は、複数の分割体の一端部を予め所定の形状に成形し、これらを接合したときにネッキング部を構成するものであるが、加工限度上、分割体の状態ではネッキング部を最終製品形状に成形することが困難である場合には、図１５及び図１６に示すように、サイジング工程の前又は後に中間加工容器（図１５の４０）の端部を修正加工して、最終形状のネッキング部を形成することができる。この場合におけるネッキング加工には、種々の方法を適用することができるが、許容縮径量、成形自由度、加工容易性及びコスト等の点で、ワーク固定式のスピニング加工が望ましい。

【００４１】図１５は、中間加工容器４０の成形時に、胴部４１に対して傾斜した中心軸を有する予成形部（プリフォーム部）４８を形成しておき、胴部４１を強固にクランプした状態で、予成形部４８をスピニング加工によって縮径し、最終形状のテーパ部４３及びボトルネック部４４を形成することとしたものである。胴部４１の中心軸（図示せず）に対する予成形部４８の中心軸Ｃｓの傾斜角が然程大きくなく、主として縮径割合を大きくしたい場合には、予成形部４８の中心軸Ｃｓを公転中心とするスピニングローラ（図示せず）によって中心軸Ｃｓに沿って絞り加工を行う同軸スピニング加工が好適である。前述の分割体に対するプレス加工においては、ネッキング部の形状に対する規制が多いため予成形部４８は所望の形状からは程遠いものとなる場合が多いが、上記のようなスピニング加工によってネッキング部に対する形状の自由度（加工自由度）が大幅に向上する。

【００４２】更に複雑な形状のネッキング部を形成する場合、例えば傾斜角と共に縮径割合も大きくしたい場合には、特許第２９５７１５４号に記載の傾斜スピニング加工を適用するとよい。即ち、図１６に示すように、中間加工容器４０の成形時に、胴部４１の中心軸に対して比較的小さい角度で傾斜した中心軸Ｃｐを有する予成形部（プリフォーム部）４９を形成しておき、この予成形部４９の中心軸Ｃｐに対して所定角度β傾斜した中心軸Ｃｔを公転中心とするスピニングローラ（図示せず）によって中心軸Ｃｔに沿って絞り加工を行い、最終形状のテーパ部４３及びボトルネック部４４を形成する方法である。そして、特許第２９５７１５４号に記載のように、中心軸Ｃｐと中心軸Ｃｔの間で複数の目標加工軸を設定して数回スピニング加工を行うようにすれば、加工限界が広がるため、ネッキング部に対する形状の自由度（加工自由度）が一層向上する。

【００４３】尚、この特許第２９５７１５４号公報に記載の傾斜スピニング加工と同様、特許第２９５７１５３号公報に記載の偏芯スピニング加工を予成形部（プリフォーム部）に適用してもよい。更に、胴部４１の中心軸とボトルネック部４４の中心軸とが、同軸、偏芯、傾斜及び捩れ（ｓｋｅｗ）を組み合わせた関係にある状態でスピニング加工を行うこととすれば、更に複雑な形状のネッキング部を形成することができる。

【００４４】而して、図１６に示すように一端側に予成形部４９が形成された後に傾斜スピニング加工が行われると共に、他端側に予成形部（図示せず）が形成された後に偏芯スピニング加工が行われた場合には、図１７に示す触媒コンバータが形成され、両側のテーパ部４３及び４５の一部にスピニング条痕Ｓが残る外観を呈することとなる。尚、サイジング工程時に段部が表れないように予成形部を形成して中間加工容器を形成した後、更に予成形部に対しスピニング加工を行うこととした場合にも、図１８に示すように、両側のテーパ部４３及び４５の一部にスピニング条痕Ｓが残る外観となる。

【００４５】尚、上記の実施形態においては、ハニカム構造体２の断面は略円形であるが、これに限らず、楕円形断面、長円断面、複数の曲率を有する面を組み合わせた断面、及び多角形断面等の非円形断面としてもよい。また、ハニカム構造体２を触媒担体に供する場合の流路（セル）断面は、ハニカム（六角形）に限らず、正方形等、任意である。更に、ハニカム構造体２は必ずしも一個である必要はなく、軸方向に２個配置してタンデム型とし、あるいは３個以上を直列に配置してもよく、胴部は、各ハニカム構造体に対応する部分毎に縮径してもよいし、連続して縮径してもよい。そして、最終製品としては、自動車の排気系部品に限らず、本発明の製造方法は種々の浄化装置（図示せず）に適用することができる。

【００４６】

【発明の効果】本発明は上述のように構成されているので以下に記載の効果を奏する。即ち、請求項１に記載の

ハニカム構造体内蔵浄化装置の製造方法においては、複数の金属製分割体を接合して成る容器内に、緩衝部材をハニカム構造体周りに装着して収容し、少なくとも緩衝部材の存在する範囲に亘って容器を縮径して緩衝部材を圧縮状態に保持し、緩衝部材の圧縮復元力によってハニカム構造体に付与される面圧を以てハニカム構造体を容器内に保持することとしているので、分割体を接合して成る容器に対しても、ハニカム構造体を容易に収容することができると共に、緩衝部材が全周に亘って均一且つ十分な圧縮力を発生し、ハニカム構造体を適切に容器内に保持することができる。

【００４７】更に、請求項２に記載のように、複数の分割体の各々の少なくとも一端部を予め所定の形状に成形し、これらを接合した容器に対しネッキング部を構成することとすれば、分割体の段階で予めネッキング部を形成することができるので、容易且つ安価に製造することができる。

【００４８】上記に加え、請求項３に記載のように、容器のネッキング部に対し、更に縮径加工を行い所定の端部形状に形成することとすれば、分割体の段階で予めネッキング部を形成できない場合にも、追加工によって所定の端部形状を容易に形成することが可能となる。特に、ネッキング部に対し、請求項４に記載のようにスピニング加工を行なうこととすれば、容易に縮径加工を行うことができ、形状設定の自由度が大きく、複雑な形状のネッキング部を形成することも可能となる。

【００４９】そして、請求項５に記載のように、ハニカム構造体に付与される面圧に応じて容器を縮径することとすれば、ハニカム構造体を最適な保持力で確実に保持し得る浄化装置を製造することができる。

【図面の簡単な説明】

【図１】本発明の一実施形態に係る製造方法において、ハニカム構造体に緩衝部材を装着した一体品を中間加工容器に収容する状態を示す斜視図である。

【図２】本発明の一実施形態に係る製造方法において、一対の分割体を接合して中間加工容器を形成する状態を示す斜視図である。

【図３】本発明の一実施形態に係る製造方法において、一対の分割体を接合する他の例によって接合した中間加工容器の側面図である。

【図４】本発明の一実施形態に係る製造方法において、ハニカム構造体及び緩衝部材の測定工程を示す正面図である。

【図５】本発明の一実施形態に係る製造方法において、中間加工容器の縮径状態を示す断面図である。

【図６】本発明の一実施形態に係る製造方法における一端部に対するスピニング加工状態を示す断面図である。

【図７】本発明の一実施形態に係る製造方法において、中間加工容器の両端部にネッキング部を形成した触媒コンバータの完成品の一例を示す正面図である。

【図８】本発明の一実施形態に係る製造方法において、中間加工容器の両端部に対し、胴部と両端部との間に段部を残すようにネッキング部を形成した触媒コンバータの完成品の一例を示す正面図である。

【図９】本発明の他の実施形態に係る製造方法において、一対の分割体の両端部を予め所定の形状に成形し、これらを接合する前の状態を示す斜視図である。

【図１０】本発明の他の実施形態に係る製造方法において、一対の分割体の両端部を予め所定の形状に成形し、これらの間に、ハニカム構造体に緩衝部材を装着した一体品を収容する状態を示す斜視図である。

【図１１】本発明の他の実施形態に係る製造方法において、ハニカム構造体に緩衝部材を装着した一体品を、一対の分割体に収容して接合した中間加工容器の一例を示す正面図である。

【図１２】本発明の他の実施形態に係る製造方法において、図１１の中間加工容器のハニカム構造体を収容した部分を縮径した状態を示す正面図である。

【図１３】本発明の更に他の実施形態に係る製造方法において、一対の分割体の両端部を予め所定の形状に成形し、これらを接合する前の状態を示す斜視図である。

【図１４】本発明の更に他の実施形態に係る製造方法において、一対の分割体の両端部を予め所定の形状に成形し、これらの間に、ハニカム構造体に緩衝部材を装着した一体品を収容する状態を示す斜視図である。

【図１５】本発明の更に他の実施形態に係る製造方法において、中間加工容器の端部を修正加工して最終形状のネッキング部を形成する状態の一例を示す部分正面図である。

【図１６】本発明の更に他の実施形態に係る製造方法において、中間加工容器の端部を修正加工して最終形状のネッキング部を形成する状態の他の例を示す部分正面図である。

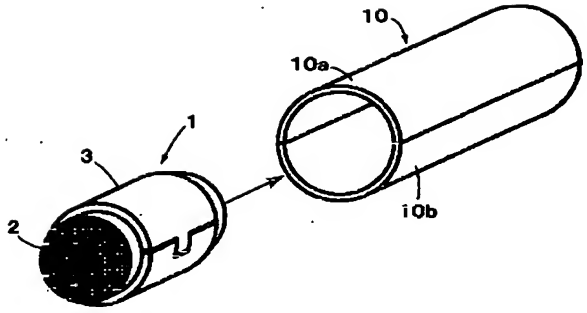
【図１７】本発明の更に他の実施形態に係る製造方法において、予成形部が形成された後にスピニング加工が行われた触媒コンバータを示す正面図である。

【図１８】本発明の更に他の実施形態に係る製造方法において、段部が表れないように予成形部を形成された後にスピニング加工が行われた触媒コンバータを示す正面図である。

【符号の説明】

１　一体品，　２　ハニカム構造体，　３　緩衝部材，１０，２０，３０，４０　中間加工容器，　１０ａ，１０ｂ　分割体，１３，１５　テーパ部，　１４，１６　ボトルネック部，　１２　段部，ＤＴ　測定装置，　ＰＭ　押圧体，　ＬＣ　ロードセル，ＲＥ　ロータリエンコーダ，　ＣＨ　クランプ装置，ＳＰ　スピニングローラ

【図1】



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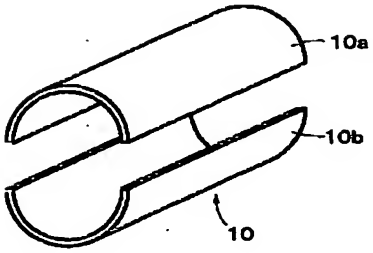

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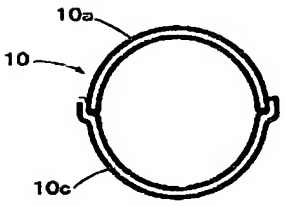

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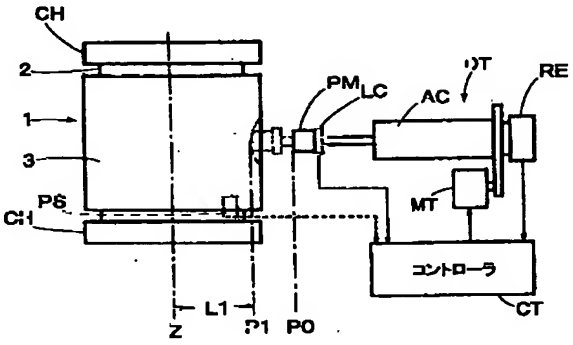

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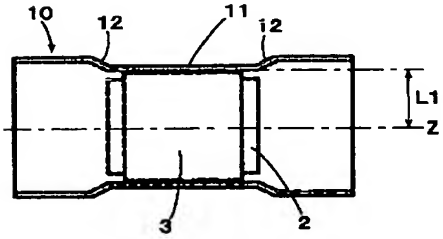

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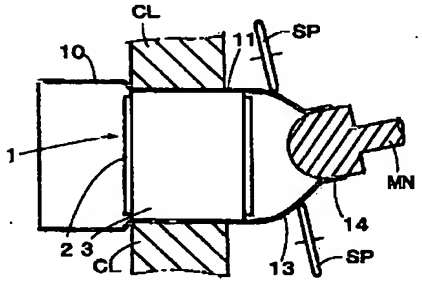

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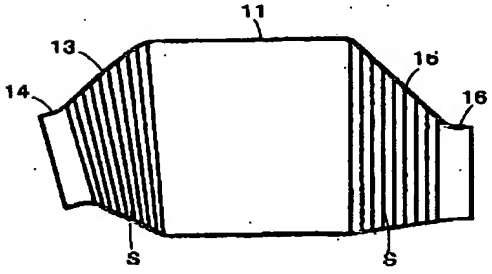

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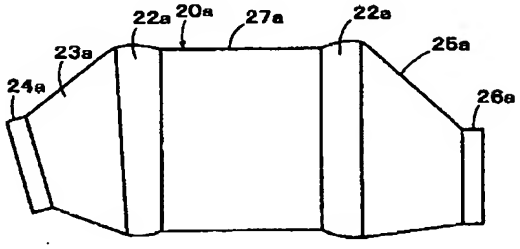

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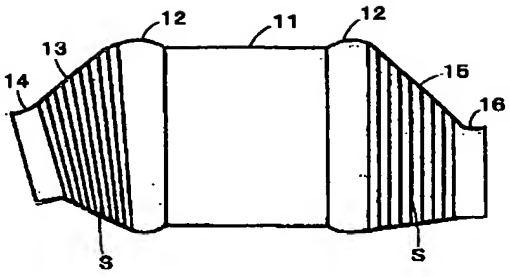

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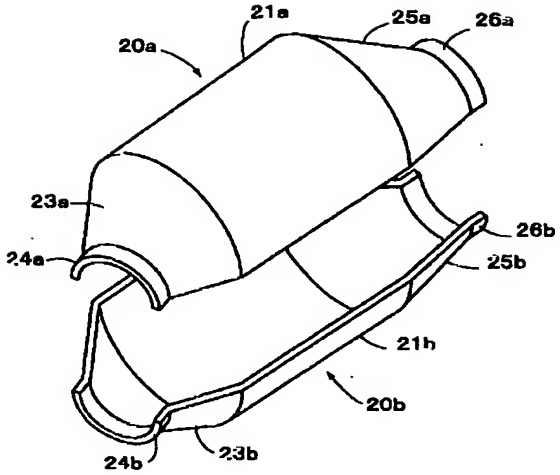

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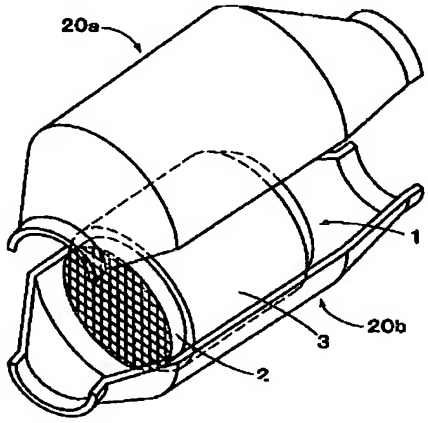

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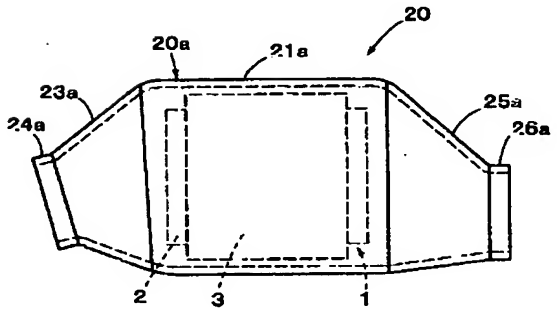

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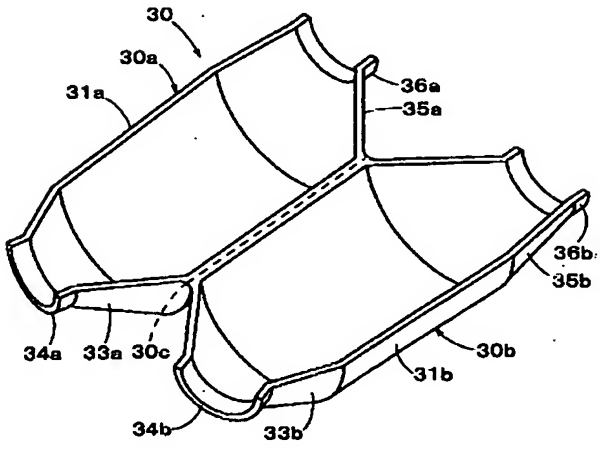

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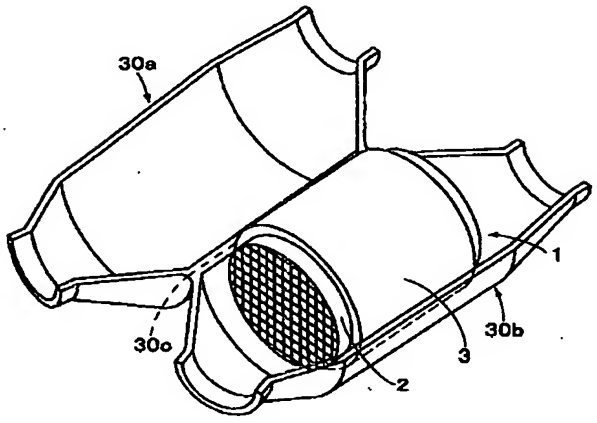

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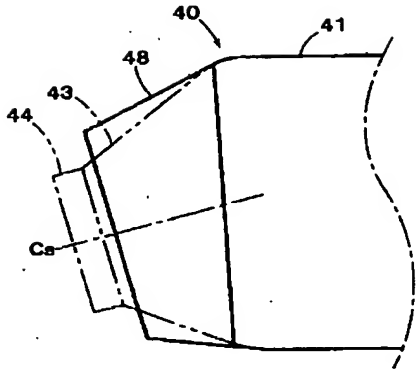

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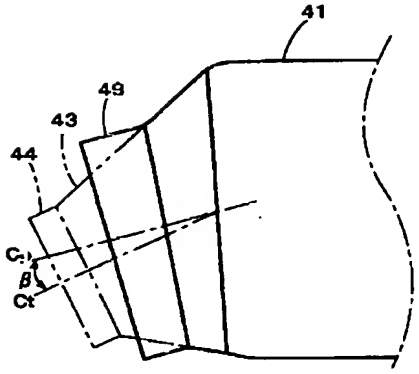

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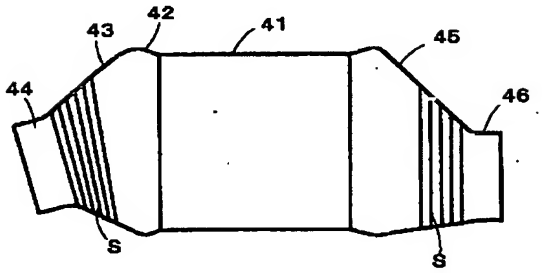

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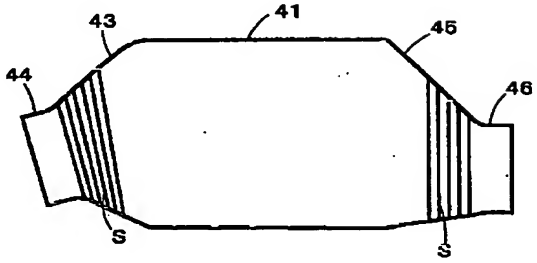

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